FIRST RECORD OF THE GENUS *HEMISARCOPTES* LIGNIÈRES (ACARI: ASTIGMATA: HEMISARCOPTIDAE) IN AUSTRALIA

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Abstract

Two species of *Hemisarcoptes* (Acari: Astigmata: Hemisarcoptidae), parasitic on armoured scale insects (Homoptera: Diaspididae) were collected from various localities in Queensland. Preliminary data on the age-dependent parasitization of one species on several hosts are presented, as well as rates of occurrence on adults of the specific vector, *Chilocorus* Leach (Coleoptera: Coccinellidae). A method of rearing the mite is described. This constitutes the first record of *Hemisarcoptes* from Australia.

Introduction

Mites of the genus *Hemisarcoptes* (Astigmata: Hemisarcoptidae) are obligate parasites of armoured scale insects (Homoptera: Diaspididae), and have been used as biological control agents of pests belonging to that family (Gerson *et al.* 1990). Mite eggs are deposited on the host, on which the larvae, protonymphs, tritonymphs and adults feed, causing scale death or reduction in fecundity. As the hosts die mites wander off in search of other prey, or, if in the younger stages, moult into heteromorphic deutonymphs, commonly called hypopodes (singular: hypopus). The latter are transmitted by coccinellid beetles of the genus *Chilocorus* Leach (Gerson *et al.* 1990), which also feed on diaspidids. The ontogeny and life history of *H. cooremani* (Thomas) were studied by Houck and OConnor (1990). The recent introduction of *H. coccophagus* Meyer into New Zealand and its effect on a diaspidid pest attacking kiwifruit (*Actinidia deliciosa*) were detailed by Hill *et al.* (1993).

Hemisarcoptes has not hitherto been known from Australia. This paper records two species from Queensland, one found near Nambour, in the south-east of the state, the other around Mareeba, in the north. As both species appear to be undescribed (at present the genus contains only four named species), the former is designated sp. 1, the other sp. 2. Specimens of both species were sent for determination to Dr Barry M. OConnor, Museum of Zoology, University of Michigan, Ann Arbor, Michigan, U.S.A., who is revising the genus. Preliminary quantitative data on the interaction of *Hemisarcoptes* sp. 2 with host scales and *Chilocorus* beetles, as well as preliminary rearing data, are given below.

Results

Hemisarcoptes sp. 1

This species was found in samples of citrus bark infested by white louse scale, *Unaspis citri* (Comstock), obtained from Nambour, in November 1992. Two batches of *Chilocorus circumdatus* Gyllenhal, a recently-introduced species (Houston 1991), together comprising about 150 beetles, were also examined. A total of nine *Hemisarcoptes* sp. 1 were found among

ca 500 female scales (the stage preferred by *Hemisarcoptes*). No deutonymphs were seen amongst these hosts or on the beetles.

Hemisarcoptes sp. 2

This species was discovered on papaw (*Carica papaya* L.) bark, heavily infested by oriental scale, *Aonidiella orientalis* (Newstead), collected at Mareeba in November 1992. A batch of 200 female scales was examined and data for young (preovipositing) and mature (ovipositing) hosts were recorded separately. A total of 81 (40.5%) hosts was attacked by *Hemisarcoptes* sp. 2; of the 51 young scales, 13 (25.5%) were parasitized, as were 68 (45.6%) of the 149 mature females; the latter were thus significantly ($p=0.011$) preferred by the mites. Such preference has been observed in another species of *Hemisarcoptes* (Izraylevich and Gerson 1993).

A different parasitization pattern was seen on the California red scale (*Aonidiella aurantii* (Maskell)). In April 1993 a sample of this diaspidid was collected from citrus trees at Mareeba. Of the 200 scales examined, 159 were mature females, of which only 2 (1.3%) were parasitized. Of the 41 young females, 14 (34.1%) carried mites ($p<0.001$). In contrast to other diaspidids, mated California red scale females appress their bodies to their shields, thereby usually barring the entrance of natural enemies to the oviposition portal. White louse scale on the same trees was likewise attacked by *Hemisarcoptes* sp. 2, but the low number of available scales precluded a quantitative assessment.

A sample comprising three species of *Chilocorus* was obtained from Mareeba in November 1992. These were the indigenous *C. australasiae* Kerville (= *baileyi* Blackburn, synonymy according to R.D. Pope, pers. comm., 1992), *C. flavidus* Blackburn, and *C. circumdatus*. Twenty specimens of *C. australasiae* had a mean of 217.6 mites/beetle (range 18-847), *C. flavidus* (n=7) carried 250.6 mites/beetle (28-615) and *C. circumdatus* (n=2) had 147 mites/beetle (113 and 181). The hypopodes were packed together under the elytra, their bodies pointing in different directions (Fig. 1; a single hypopus is shown in Fig. 2). A few deutonymphs were seen on the folded hind wings, the thorax and even on the beetles' dorsum, including their heads. All 27 beetles examined carried mites.

Pinned *Chilocorus* specimens, in the Queensland Department of Primary Industries Insect Collection, Indooroopilly, were examined externally. Deutonymphs of a *Hemisarcoptes* were noted on beetles (mostly *C. australasiae*) collected at Ayr (from citrus), Innisfail (coconut) and Walkamin (mango). If it is assumed that these are deutonymphs of *Hemisarcoptes* sp. 2, then its distribution extends from Mareeba in the north to Ayr in the south, the mite feeding on diaspidids attacking several major treefruit crops.

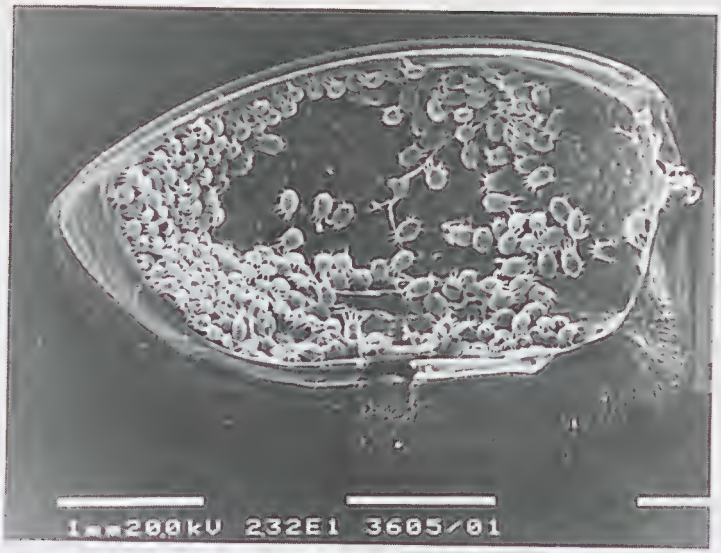

Fig. 1. Scanning electron micrograph of deutonymphs (n=204) of *Hemisarcoptes* sp. 2 on an elytron of *Chilocorus australasiae*.

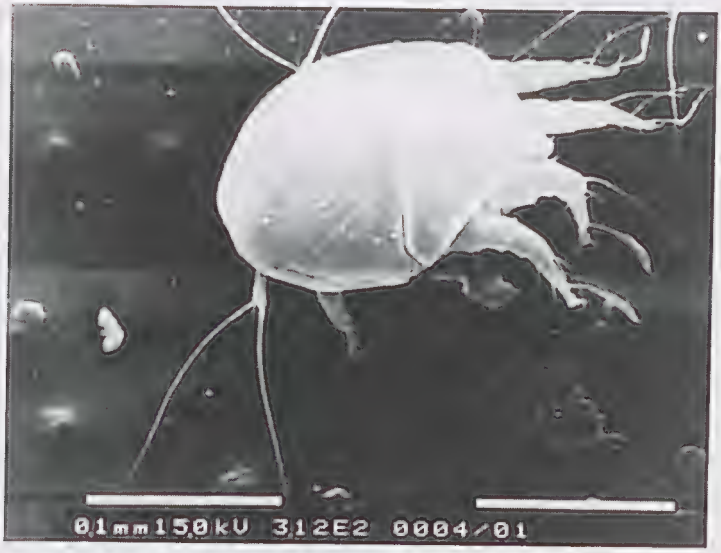

Fig. 2. Scanning electron micrograph of a single deutonymph of *Hemisarcoptes* sp. 2.

Rearing methods

Hemisarcoptes sp. 2 was cultured in the laboratory (21-24°C, no humidity modifications) by placing deutonymph-laden elytra of *C. australasiae* onto potato tubers previously infested by latania scale, *Hemiberlesia lataniae* (Signoret). Feeding mite stages were seen within two weeks, and eggs after another week. Several generations of the mite were reared and numbers have increased substantially, indicating the success of this simple culturing method. Very few deutonymphs were seen.

Discussion

These records of *Hemisarcoptes* from Australia make available two additional species of natural enemies of armoured scale insects. The large numbers of *Hemisarcoptes* sp. 2 obtained from various host scales and beetle vectors, and the localities whence it had been collected, suggest that it is an indigenous, tropical species. Nothing may at this time be speculated about the origin of *Hemisarcoptes* sp. 1. The fact that the introduced *C. circumdatus* carried hefty (>100) deutonymph loads attests to the ease with which these organisms produce new associations, and should facilitate wider establishment of these beneficial mites.

Acknowledgements

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